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United States Telephone Association

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February 1, 1995 ~~RECEIVED~~

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*FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY*

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street NW - Room 222
Washington, D.C.   20554

RE: Ex Parte Filing
       CC Docket No. 94-1

DOCKET FILE COPY ORIGINAL

Dear Mr. Caton:

Attached is an affidavit prepared by Dr. Laurits Christensen of Christensen Associates. This affidavit was commissioned by the United States Telephone Association (USTA) to discuss why an input price adjustment (which has been suggested by some parties to this proceeding) would be an inappropriate addition to the LEC price cap formula being reviewed in this proceeding.

An original and two copies of this ex parte notice and attachment are being filed in the Office of the Secretary on February 1, 1995. Please include this notice and attached material in the public record of these proceedings.

Respectfully Submitted

Frank McKennedy
Director - Policy Analysis

cc: Richard Metzger
       Michael Katz
       Mark Uretsky
       Dr. Anthony Bush
       Alexander Belinfante

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AN INPUT PRICE ADJUSTMENT WOULD BE

AN INAPPROPRIATE ADDITION TO THE

LEC PRICE CAP FORMULA:

AFFIDAVIT OF DR. LAURITS R. CHRISTENSEN

ON BEHALF OF THE UNITED STATES TELEPHONE ASSOCIATION

CC DOCKET NO. 94-1

February 1, 1995

AN INPUT PRICE ADJUSTMENT WOULD BE
AN INAPPROPRIATE ADDITION TO THE
LEC PRICE CAP FORMULA:
AFFIDAVIT OF DR. LAURITS R. CHRISTENSEN
ON BEHALF OF THE UNITED STATES TELEPHONE ASSOCIATION

CC DOCKET NO. 94-1
January 30, 1995

Introduction

My name is Laurits R. Christensen. I am President of Christensen

Associates, an economic consulting firm located at 4610 University Avenue in

Madison, Wisconsin. I studied engineering and economics at Cornell University,

from which I graduated in 1964. I did my graduate work at the University of

California, Berkeley, where I obtained an M.S. in statistics and a Ph.D. in

economics. From 1967 to 1987 I was a Professor of Economics at the University

of Wisconsin-Madison. Since 1976 I have also been President of Christensen

Associates.

The purpose of this affidavit is to discuss issues regarding productivity and

input prices as they relate to the LEC price cap formula. In particular, I will rebut

the claim by Dr. Lee L. Selwyn that it would be appropriate to add an input price

adjustment to the LEC price cap formula.[1] Dr. Selwyn and I both use the term

productivity synonymously with the more technical term Total Factor Productivity

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[1] Dr. Selwyn's views can be found in the Economics and Technology, Inc., report, "An Empirical Estimate of the LEC Price Cap 'X Factor'," filed as Attachment A to the Reply Comments of The Ad Hoc Telecommunications Users Committee, CC Docket No. 94-1, June 29, 1994.

(TFP). Productivity or TFP refers to the amount of goods and services produced by a firm, an industry, or a national economy, relative to the amount of labor, capital, and other inputs needed to produce the goods and services. The higher is this productivity ratio, the lower is the real cost of production. High productivity in the U.S. economy is the primary basis for the high standard of living that we have achieved in the United States. The term input prices refers to the per unit cost to business firms of acquiring labor services, capital services, and other inputs.

Qualifications

I have specialized in productivity analysis ever since my graduate studies in the mid-1960's, and I have published numerous papers on this subject. These papers include methodological developments, as well as actual measurement of productivity performance for individual firms and industries, and for the entire economies of various countries.

I have extensive experience analyzing productivity for telephone companies. In the late 1970's I performed an in-depth study of productivity performance for AT&T and the Bell System. This study served as the basis for my testimony regarding productivity in the U.S. Department of Justice v. AT&T antitrust case.

In recent years, I have studied productivity issues for AT&T, U S West, BellSouth, NYNEX, Southwestern Bell, and Ameritech. I have filed comments and studies and have testified regarding telephone company productivity and related issues before the Federal Communications Commission, as well as public service

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commissions in Arkansas, Colorado, Illinois, Indiana, Iowa, Maine, Massachusetts, North Dakota, Ohio, Washington, and Wisconsin.

My professional experience includes the analysis of input prices. The proper treatment of input prices is an important aspect of the accurate measurement of productivity growth. Many of my professional papers include discussion of input price measurement. For example, my 1969 paper (co-authored with Professor Dale W. Jorgenson of Harvard University) "The Measurement of U.S. Real Capital Input, 1929-1967" discusses the proper measurement of input prices for capital services, and is often cited as a reference for capital input price measurement. I have also filed comments and testified regarding input prices for telephone companies before the FCC and state regulatory commissions in Illinois, Ohio, Maine, Massachusetts, and Washington.

I have been involved in the development of indexes for alternative regulation. The FCC cited my AT&T productivity study as a basis for its choice of the productivity offset in the AT&T price cap plan, and I have testified in North Dakota, Wisconsin, Illinois, Indiana, Ohio, Maine, Massachusetts, and Washington regarding the appropriate treatment of productivity in alternative regulation plans.

I also have experience in the design of alternative regulation plans in other industries. The productivity adjustment mechanism that is used by the Interstate Commerce Commission to set the price cap for railroad freight traffic was proposed by me and my colleague, Dr. Douglas W. Caves. In addition, I am currently

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working with electric, gas, and telephone companies in the establishment of indexes to be used in alternative regulation plans.

Conceptual Framework for Price Cap Formula

Dr. Selwyn and I agree that the difference between the trends in Total Factor Productivity for the LECs and the entire U.S. economy is the appropriate concept for specifying the productivity offset in the LEC price cap formula. We disagree, however, on the necessity of adding an input price adjustment to the LEC price cap formula.

In my revised and updated USTA study I found a productivity growth trend for the LECs of 2.4% per year for the 1985-1992 period.[2] The productivity growth trend for the entire U.S. economy during that period is .3% per year, based on the most recent data from the U.S. Bureau of Labor Statistics. The difference is 2.1% per year, which I believe is the proper productivity offset for the LEC price cap formula.

Dr. Selwyn has claimed, without any corroborating data, that in the near future LEC input prices are likely to rise slower than input prices for the entire U.S. economy. This position on input price growth is indefensible, as I demonstrate below. There is no conceptual or empirical basis for presuming that LEC input

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[2]On January 16, 1995, I released a revised and updated version of my study, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation" (co-authored with P. E. Schoech and M. E. Meitzen).

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prices will increase significantly slower than input prices for the entire U.S. economy.

Input Price Analysis

Telephone companies compete for labor, capital, and other inputs with all other sectors of the U.S. economy. Therefore, one would expect input prices for telephone companies to have the same long-term trend as other sectors of the economy, and hence, the same as the entire U.S. economy. This expectation is validated by long-term historical evidence.

Over the period 1949 to 1992, input prices for U.S. telephone companies grew at virtually the same rate as for the rest of the economy. Exhibit A shows the year-by-year percentage changes in input prices for the U.S. economy and U.S. telephone companies. For the full 44-year period, input price growth averaged 4.8% per year for the U.S. economy and 4.7% per year for telephone companies. The graph shows that, in spite of the pronounced short-term volatility in both series, the long-term patterns are the same.

It is straightforward to conduct a formal statistical test of the hypothesis that the trend in input price growth for the telephone industry equals the trend in input price growth for the entire U.S. economy. I have performed this test and found that there is no evidence that the input price trends differ. Details of the test are presented in Exhibit A. The result holds for the full 1949-1992 period, as well as for the 1949-1984 and 1985-1992 sub-periods. This means that any

observed short-term differences in input price growth cannot be properly construed as representing a difference in the underlying trends of input prices for the LECs and the entire U.S. economy.

Furthermore, neither Dr. Selwyn nor anyone else has provided evidence to support the proposition that LEC input prices will rise slower than U.S. economy input prices in the near future. U.S. economy input price growth reflects changes in prices for labor input and prices for capital input. Current evidence on LEC labor and capital input price trends supports an expectation that they will not differ significantly from their economy-wide counterparts. I will now discuss this evidence.

Over the post-divestiture period the LEC labor input price and the U.S. economy labor input price have shown similar trends. This is shown in Exhibit B. Relative to a normalized labor input price of 1.000 in 1984, the LEC labor input price in 1993 was 1.478 and the U.S. economy labor input price was 1.426. In spite of the similar trends, the rates of growth differed from year to year. This is shown in Exhibit C. In Exhibit D, I present both the relative labor input prices and their rates of growth for each year from 1985 to 1993. The average rate of growth for the LECs was 4.3% per year, and the average rate of growth for the U.S. economy was 3.9% per year.

Since the start of the price cap plan for the LECs in 1991, the LEC labor input price has increased more rapidly than the U.S. economy labor input price in every year: growth in the LEC labor input price has averaged 6.7% per year, while

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growth in the labor input price for the U.S. economy has averaged 3.8% per year. Extrapolation of the lines in Exhibit B would suggest that the labor input price for the LECs would rise more rapidly than for the U.S. economy following 1993. But such an extrapolation would be unwarranted, since it is inappropriate to attempt to forecast differential growth when there is no evidence of a difference in the underlying trends.

I will now discuss recent changes in measured capital input prices for the LECs and the entire U.S. economy. The most important factor that drives changes in the price of capital input is the opportunity cost of capital. Most LEC capital goods and U.S. economy capital goods are owned by the firms employing them. The largest annual cost of owning these capital goods is the foregone returns that could be earned by the funds that were used to acquire the capital goods.

For my USTA study of LEC productivity growth, I used Moody's composite yield for public utility bonds as a proxy for the opportunity cost of capital for all LECs.[3] This yield fell from 14.03% in 1984 to 7.56% in 1993. This decline mirrored changes that took place in all market interest rates in the United States. For example the yield on 30-year U.S. Treasury bonds fell from 12.41% in 1984 to 6.59% in 1993. In Exhibit E, I present both the Moody's public utility bond yield

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[3]Since the yield on public utility bonds reflects the cost of debt, but not equity, and since the cost of equity is typically higher than the cost of debt, this proxy will tend to understate the full opportunity cost of capital to the LECs. Moreover, since the cost of debt has recently fallen relative to the cost of equity, this proxy has declined relative to the full opportunity cost of capital to the LECs.

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and the 30-year Treasury rate for all years from 1984 through 1993. Other market interest rates show similar time patterns.

All sectors of the U.S. economy experienced similar declines in the "carrying costs" for owner-employed capital goods. However, capital input prices for the U.S. economy are not measured the same way that I have measured them for the LECs. Therefore, because they are measured differently, the pattern of measured capital input prices for the LECs and the entire economy differ. Capital input costs for the U.S. economy are measured residually, based on net income, rather than directly based on interest costs--as I have for the LECs. In the 1980's and early 1990's profits in the U.S. economy increased at the same time that interest rates were falling. The measurement of U.S. capital input prices commingles profits with the opportunity cost of capital. In Exhibit F, I present the opportunity cost of capital for the U.S. economy, as it is implicitly measured in the U.S. National Income and Product Accounts. What Exhibit F shows is that the implicit opportunity cost of capital for the U.S. economy does not reflect the dramatic decline in interest rates during the 1985 to 1992 period. In fact, the implicit opportunity cost is actually higher in 1992 than it was in 1984.

Since changes in capital input prices are driven primarily by changes in the opportunity cost of capital, use of the opportunity cost implicit in the U.S. National Income and Product Accounts, gives the erroneous impression that LEC capital input prices declined substantially relative to other firms in the economy. But other firms and sectors actually had the same type of decline in opportunity cost that

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was experienced by the LECs. Therefore, a meaningful comparison of capital input price growth for the LECs and the rest of the U.S. economy cannot be made using my USTA productivity study and the U.S. National Income and Product Accounts-- because they are measuring two different concepts.

Even though the lines in Exhibit F measure different concepts, on a going-forward basis, they cannot continue to diverge. This follows because interest rates have declined from levels that are extremely high by historical standards to a level that is more in keeping with historical norms. In fact, in 1994 interest rates increased substantially, as manifested by Moody's composite yield on public utility bonds being as high as 9% late in 1994. Therefore, although LEC capital input prices as measured in my USTA productivity study and capital input prices for the entire U.S. economy (as measured in the U.S. National Income and Product Accounts) are not directly comparable, in the near future they are likely to grow at similar rates.

Concluding Remarks

There is no reason to expect telephone company input prices to rise slower than input price growth for other sectors of the U.S. economy. This concept is validated by the fact that the long-term trends are the same. Short-term input price data exhibit substantial volatility, but provide no evidence of divergent trends. From 1985 to 1993 the LEC measured capital input price rose slower than the measured capital input price for the U.S. economy, and the LEC labor input price

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rose faster than the labor input price for the U.S. economy. But neither of these differences can be properly construed as a change in long-term trends. Hence, because they cannot be expected to continue, they cannot form the basis for appropriate regulatory policy. In particular the short-term difference in measured capital input prices reflects the fact that measured LEC capital input prices reflect a much larger weight on interest rates than measured U.S. capital input prices, and the fact that up until 1993 the post-divestiture period has been a time of declining interest rates. A rise in interest rates, such as occurred in 1994, will cause a short-term difference in the opposite direction.

Neither Dr. Selwyn, nor anyone else, has provided any evidence in this proceeding that, on a going-forward basis, LEC input price growth will be slower than input price growth for the entire U.S. economy. As I have shown, Dr. Selwyn's claim that my USTA study provides such evidence is simply incorrect, and he has provided no other evidence.

Given that short-term fluctuations in input prices provide no basis for forecasting future changes in input prices, I believe it would be inappropriate for the Commission to include an adjustment in the LEC price cap formula to reflect recent short-term fluctuations in input prices. Such an adjustment would just as likely, indeed probably more likely, be in the wrong direction. This is because short-term differences in one direction tend to be offset by subsequent short-term differences in the other direction, a mechanism that underlies the finding of no difference in the long-term trends of input prices for the LECs and the U.S.

economy. This might well result in a "double-whammy" for the LECs: a downward adjustment in the price cap based on recent data, when actual experience might require an upward adjustment in the price cap to compensate the LECs for faster input price growth than experienced by the rest of the U.S. economy.

Exhibit A

U.S. Economy and Telephone Industry Input Price Growth

Comparison of U.S. Economy Input Price Growth with Telephone Industry Input Price Growth
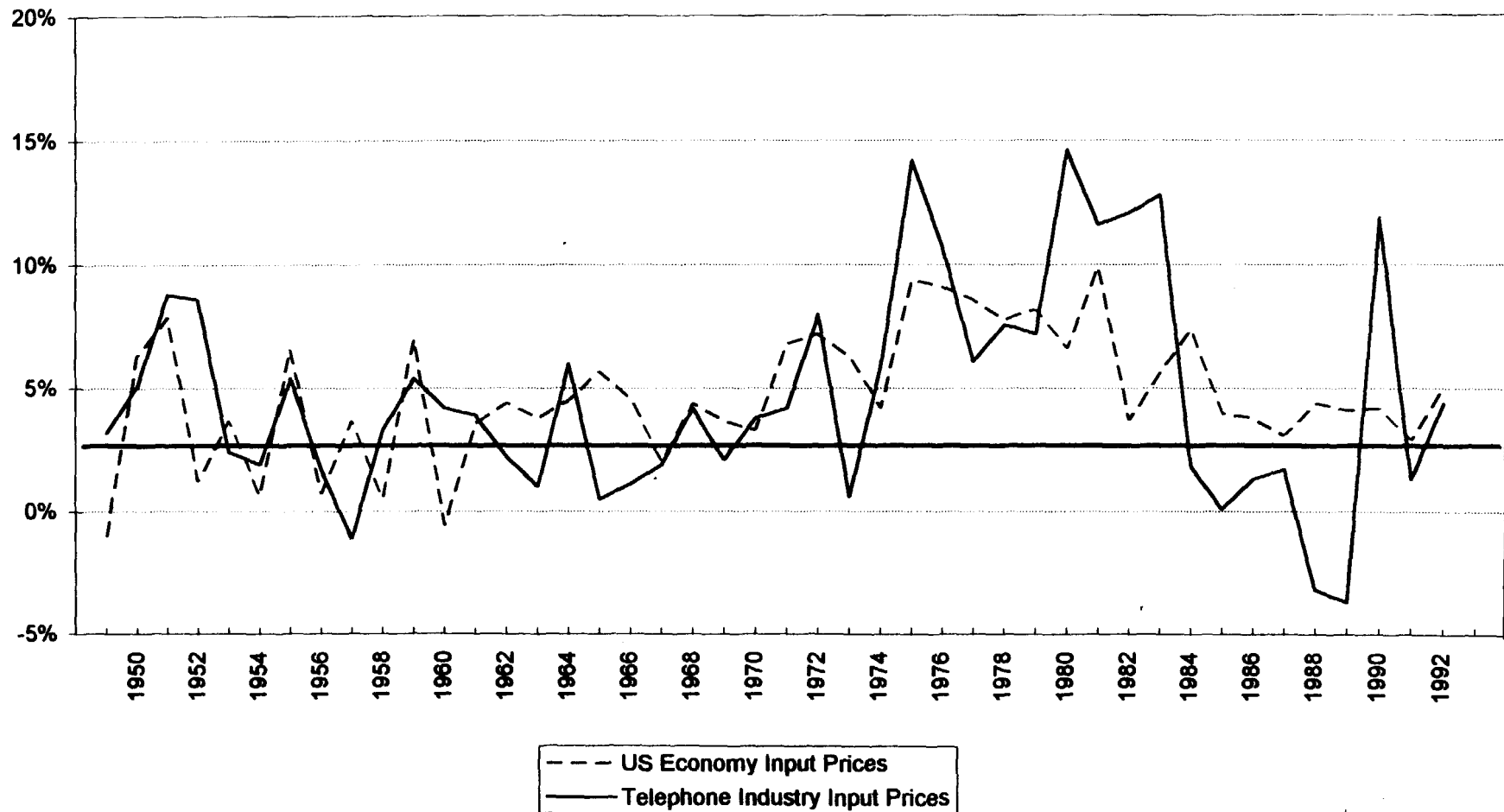
1948-1992 averages: 4.8% U.S. Economy
4.7% Telephone Industry

Comparison of US Economy Input Price Growth
with Telephone Industry Input Price Growth

	Percent Change	
	US Economy Input Prices	Telephone Industry Input Prices
1949	-1.0%	3.2%
1950	6.3%	5.1%
1951	7.9%	8.8%
1952	1.2%	8.6%
1953	3.7%	2.4%
1954	0.6%	1.9%
1955	6.6%	5.4%
1956	0.7%	1.7%
1957	3.7%	-1.1%
1958	0.5%	3.3%
1959	7.0%	5.4%
1960	-0.6%	4.2%
1961	3.6%	3.9%
1962	4.4%	2.2%
1963	3.8%	1.0%
1964	4.5%	6.0%
1965	5.7%	0.5%
1966	4.6%	1.1%
1967	2.0%	1.9%
1968	4.4%	4.2%
1969	3.7%	2.1%
1970	3.3%	3.8%
1971	6.8%	4.2%
1972	7.2%	8.0%
1973	6.3%	0.6%
1974	4.2%	5.9%
1975	9.4%	14.2%
1976	9.1%	10.7%
1977	8.6%	6.1%
1978	7.8%	7.6%
1979	8.2%	7.2%
1980	6.6%	14.6%
1981	9.9%	11.6%
1982	3.7%	12.1%
1983	5.6%	12.8%
1984	7.4%	1.8%
1985	4.0%	0.1%
1986	3.8%	1.3%
1987	3.1%	1.7%
1988	4.4%	-3.2%
1989	4.1%	-3.7%
1990	4.2%	11.9%
1991	2.9%	1.3%
1992	5.1%	4.4%
Average (1948 - 1992)	4.8%	4.7%

Note: Percent changes computed as logarithmic rate of growth.

Statistical Test of the Hypothesis that
LEC Input Price Growth Equals
U.S. Economy Input Price Growth

In order to determine if LEC input prices and U.S. economy input prices grow at the same rate, a t-test of this hypothesis was computed for three time periods: 1949-1992, 1949-1984, and 1985-1992. The values of the t-statistics and the critical values for the 95% confidence region are shown below:

Time Period	T-Statistic	Critical Value
1949-1992	-.08	2.02
1949-1984	.70	2.03
1985-1992	-1.67	2.31

Telephone Input Prices

    1948-1979   L. R. Christensen, D. C. Christensen, and P. E. Schoech, "Total Factor Productivity in the Bell System, 1947-1979," Christensen Associates, Sept. 1981.

    1979-1982   Bell Communications Research, <u>Econometric Estimation of the Marginal Operating Cost of Interstate Access</u>, May 1987.

    1982-1984   L. R. Christensen, "Total Productivity Growth in the U.S. Telecommunications Industry and the U.S. Economy, 1951-1987," Schedule 3 to Direct Testimony, Case No. PU-2320-90-149, North Dakota Public Service Commission, 1990.

    1984-1992   L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.

U.S. Economy Input Prices

    1948-1984   L. R. Christensen and D. W. Jorgenson, "U.S. Real Product and Real Factor Input, 1929-1967," <u>Review of Income and Wealth</u>, Series 16, March 1978, updated September 1986.
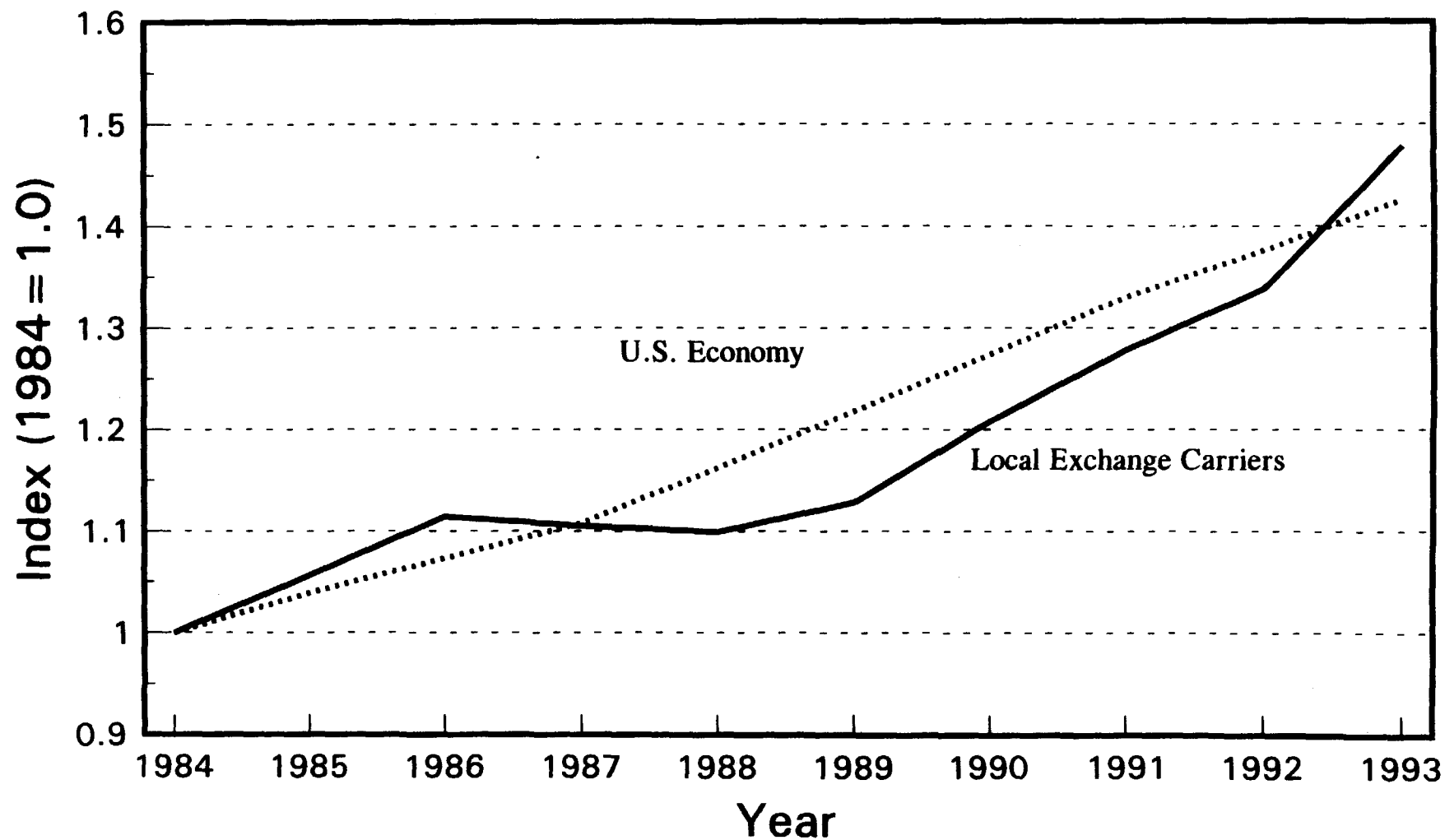
    1984-1992   U.S. Bureau of Economic Analysis, Gross Domestic Product Price Index; and U.S. Bureau of Labor Statistics, Multifactor Productivity for the Private Business Sector.

Exhibit B

Labor Price Indexes
Local Exchange Carriers and U.S. Economy

Labor Input Price Indexes
Local Exchange Carriers and U.S. Economy
1984-1993

U.S. Economy Labor Input Price Index: Employment Cost Index, Total Compensation, Private Industry; Economic Report of the President, February 1994, Table B-46.

Local Exchange Carrier Labor Input Price Index: L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.
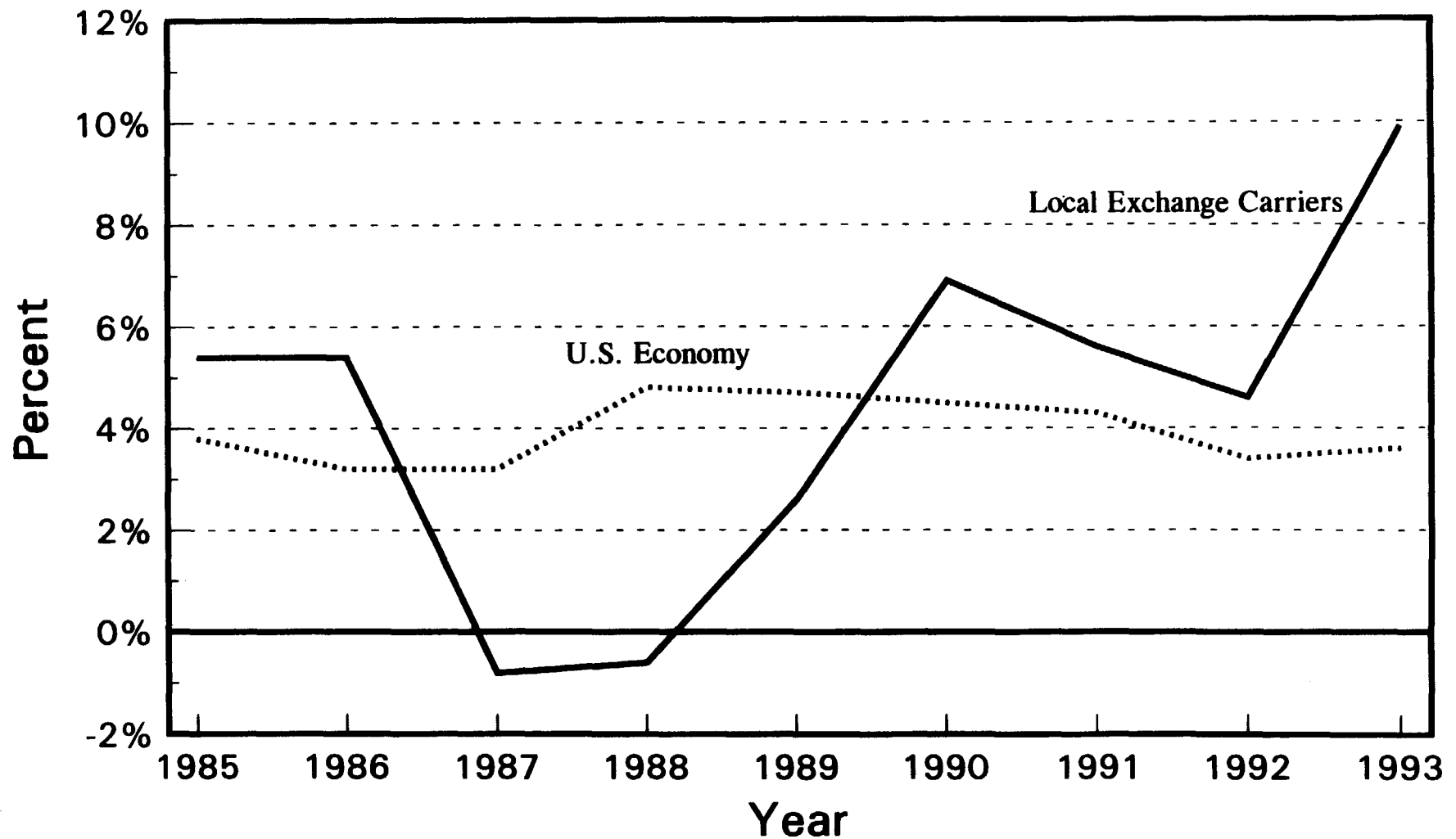
Exhibit C

Labor Input Price Growth
Local Exchange Carriers and U.S. Economy

**Labor Input Price Growth
Local Exchange Carriers and U.S. Economy
1985-1993**

U.S. Economy Labor Input Price Index: Employment Cost Index, Total Compensation, Private Industry; <u>Economic Report of the President</u>, February 1994, Table B-46.

Local Exchange Carrier Labor Input Price Index: L. R. Christensen, P. E. Schoech, and M. E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation, 1993 Update," Christensen Associates, January 1995.

Exhibit D
Labor Price Indexes
Local Exchange Carriers and U.S. Economy